NATIONAL GUIDELINE CLEARINGHOUSE™ (NGC) GUIDELINE SYNTHESIS

CHRONIC OBSTRUCTIVE PULMONARY DISEASE (COPD): PULMONARY REHABILITATION

GUIDELINES BEING COMPARED

1. **American College of Chest Physicians/American Association of Cardiovascular and Pulmonary Rehabilitation (ACCP/AACVPR)**. Pulmonary rehabilitation: joint ACCP/AACVPR evidence-based clinical practice guidelines. Chest 2007 May;131(5 Suppl):4S-42S. [211 references]
2. **Global Initiative for Chronic Obstructive Lung Disease (GOLD)**. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease. Bethesda (MD): Global Initiative for Chronic Obstructive Lung Disease (GOLD); 2008. 94 p. [435 references]
3. **Singapore Ministry of Health (SMOH)**. Chronic obstructive pulmonary disease. Singapore: Singapore Ministry of Health; 2006 Oct. 84 p. [155 references]
4. **Department of Veterans Affairs, Department of Defense (VA/DoD)**. VA/DoD clinical practice guideline for management of outpatient chronic obstructive pulmonary disease Washington (DC): Department of Veteran Affairs, Department of Defense; 2007. 138 p.

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AREAS OF AGREEMENT AND DIFFERENCE

A direct comparison of recommendations presented in the above guidelines for pulmonary rehabilitation of patients with COPD is provided below.

Areas of Agreement

Exercise Training

There is overall agreement that exercise training is the cornerstone of any pulmonary rehabilitation program and should include endurance training of the muscles of ambulation. With regard to upper body exercises, there is overall agreement that they are helpful for building muscle. GOLD notes that there are no randomized clinical trial data to support the routine inclusion of upper limb exercises, but they may be helpful in patients with comorbidities that restrict other forms of exercise and those with evidence of respiratory muscle weakness. They add that the addition of upper limb exercises or other strength training to aerobic training is effective in improving strength, but does not improve quality of life or exercise tolerance.

ACCP/AACVPR and GOLD provide recommendations regarding the duration of pulmonary rehabilitation programs, and agree that the longer a program continues, the more effective the results. ACCP/AACVPR notes that 6 to 12 weeks of pulmonary rehabilitation produces benefits in several outcomes that decline gradually over 12 to 18 months, and that programs lasting at least 12 weeks produce greater sustained benefits than shorter programs. GOLD provides slightly different figures, but similarly notes that the minimum length of an effective rehabilitation program is 6 weeks. They add that in practice, the length depends on the resources available and usually ranges from 4 to 10 weeks, with longer programs resulting in larger effects than shorter programs. GOLD adds that if no formal program is available to patients, it is reasonable for physicians to advise them to exercise on their own. With regard to other interventions, ACCP/AACVPR and VA/DoD agree that the evidence does not support use of respiratory muscle training in pulmonary rehabilitation programs.

Patient Selection

There is overall agreement that pulmonary rehabilitation is appropriate for stable patients considered to be functionally disabled by the symptoms of COPD. SMOH and VA/DoD cite persistent dyspnea, reduced exercise tolerance, a restriction in activities, and impaired health status as factors that should prompt consideration of pulmonary rehabilitation. With regard to the functional status of candidates for pulmonary rehabilitation, GOLD states that benefits have been seen in patients with a wide range of disability and that the MRC dyspnoea scale may be helpful in selecting patients most likely to benefit. VA/DoD notes that patients who consider themselves disabled by COPD are typically Level 3 and above on the dyspnea scale. According to ACCP/AACVPR, patients with advanced disease can benefit if they are selected appropriately and if realistic goals are set. There is overall agreement that pulmonary rehabilitation is most likely not suitable for patients with certain conditions, such as an inability to walk, unstable angina, or recent myocardial infarction. The groups agree that patient motivation may be an important factor to consider while determining suitability for pulmonary rehabilitation.

Nutritional Interventions/Counseling

GOLD and ACCP/AACVPR agree that there is insufficient evidence to support the routine use of nutritional supplementation in pulmonary rehabilitation patients. GOLD goes into greatest detail, providing recommendations for the identification and correction of reduced calorie intake in COPD patients. They note that a reduction in BMI is an independent risk factor for mortality in COPD patients. SMOH recommends that nutritional intervention be included in a program of pulmonary rehabilitation, but does not provide specific recommendations. VA/DoD notes that the benefit of nutritional therapy as a single intervention, without exercise, is less well documented than other interventions.

Education

There is overall agreement between the guideline groups that education should be included in pulmonary rehabilitation programs. ACCP/AACVPR and VA/DoD agree that education should include information on self-management and prevention and treatment of exacerbations. VA/DoD also recommends self-management programs include skills training to optimally control the disease, education about medications and devices, and other aspects of coping with the disease. GOLD and SMOH recommend that education be included in a program of pulmonary rehabilitation, but do not provide specific recommendations. GOLD states that although most pulmonary rehabilitation programs include an educational component, the specific contributions of education to the improvements seen after pulmonary rehabilitation remain unclear.

Psychosocial Interventions

ACCP/AACVPR, SMOH and VA/DoD agree that while there is minimal evidence to support psychosocial/behavioral interventions as a single therapeutic intervention, current practice and opinion do support their inclusion as a component of comprehensive pulmonary rehabilitation programs. SMOH recommends that interventions such as smoking cessation clinics and support groups addressing psychosocial issues be included.

Follow-Up

ACCP/AACVPR notes that maintenance strategies following pulmonary rehabilitation have a modest effect on long-term outcomes. GOLD goes into the greatest detail, recommending baseline and outcome assessments be performed to quantify individual gains and target areas for improvement. They cite specific elements that should be included in the assessments, and note that questionnaires can be useful tools in performing recommended assessments. SMOH and VA/DoD do not provide recommendations.

Areas of Difference

Exercise Training

Recommendations regarding the use of supplemental oxygen during exercise differ. ACCP/AACVPR recommends supplemental oxygen be used during rehabilitative exercise training in patients with severe exercise-induced hypoxemia. They also state that administering supplemental oxygen during high-intensity exercise programs in patients without exercise-induced hypoxemia may improve gains in exercise endurance. According to GOLD, however, other

approaches to improving outcomes, such as use of oxygen during exercise, remain experimental at present.

COMPARISON OF RECOMMENDATIONS	
GENERAL RECOMMENDATIONS **Abbreviations** **Back to TOC**	
ACCP/AACVPR (2007)	Comprehensive pulmonary rehabilitation programs include patient assessment, exercise training, education, and psychosocial support. The interdisciplinary team of health-care professionals in pulmonary rehabilitation may include physicians; nurses; respiratory, physical, and occupational therapists; psychologists; exercise specialists; and/or others with appropriate expertise. The specific team make-up depends on the resources and expertise available, but usually includes at least one full-time staff member. **Recommendations** • Pulmonary rehabilitation improves the symptom of dyspnea in patients with COPD. **Grade of Recommendation 1A** • Pulmonary rehabilitation improves HRQOL in patients with COPD. **Grade of Recommendation 1A** • Pulmonary rehabilitation reduces the number of hospital days and other measures of health-care utilization in patients with COPD. **Grade of Recommendation 2B** • Pulmonary rehabilitation is cost-effective in patients with COPD. **Grade of Recommendation 2C** • There is insufficient evidence to determine if pulmonary rehabilitation improves survival in patients with COPD. **No recommendation is provided**. • There are psychosocial benefits from comprehensive pulmonary rehabilitation programs in patients with COPD. **Grade of Recommendation 2B** • Six to 12 weeks of pulmonary rehabilitation produces benefits in several outcomes that decline gradually over 12 to 18 months. **Grade of Recommendation 1A**. Some benefits, such as HRQOL, remain above control at 12 to 18 months. **Grade of Recommendation 1C** • Longer pulmonary rehabilitation programs (12 weeks) produce greater sustained benefits than shorter programs. **Grade of Recommendation 2C** • Maintenance strategies following pulmonary

	rehabilitation have a modest effect on long-term outcomes. **Grade of Recommendation 2C** • Current scientific evidence does not support the routine use of anabolic agents in pulmonary rehabilitation for patients with COPD. **Grade of Recommendation 2C** • Pulmonary rehabilitation is beneficial for some patients with chronic respiratory diseases other than COPD. **Grade of Recommendation 1B** • Although no recommendation is provided since scientific evidence is lacking, current practice and expert opinion suggest that pulmonary rehabilitation for patients with chronic respiratory diseases other than COPD should be modified to include treatment strategies specific to individual diseases and patients in addition to treatment strategies common to both COPD and non-COPD patients.
GOLD (2008)	*Rehabilitation* The principal goals of pulmonary rehabilitation are to reduce symptoms, improve quality of life, and increase physical and emotional participation in everyday activities. To accomplish these goals, pulmonary rehabilitation covers a range of non-pulmonary problems that may not be adequately addressed by medical therapy for COPD. Such problems, which especially affect patients with *Stage II: Moderate COPD*, *Stage III: Severe COPD*, and *Stage IV: Very Severe COPD*, include exercise de-conditioning, relative social isolation, altered mood states (especially depression), muscle wasting, and weight loss. These problems have complex interrelationships and improvement in any one of these interlinked processes can interrupt the "vicious circle" in COPD so that positive gains occur in all aspects of the illness (see Figure 5.3-9 in the original guideline document). Comprehensive statements on pulmonary rehabilitation are available. See Figure 5.3-10 in the original guideline document for a list of benefits of pulmonary rehabilitation in COPD. <u>Components of Pulmonary Rehabilitation Programs</u> The components of pulmonary rehabilitation vary widely from program to program, but a comprehensive pulmonary rehabilitation program includes exercise training, nutrition counseling, and education. See the individual sections of this synthesis for a discussion of these components.

	Patient Selection and Program Design Ideally, pulmonary rehabilitation should involve several types of health professionals. Significant benefits can also occur with more limited personnel, as long as dedicated professionals are aware of the needs of each patient. Benefits have been reported from rehabilitation programs conducted in inpatient, outpatient, and home settings. Considerations of cost and availability most often determine the choice of setting. The educational and exercise training components of rehabilitation are usually conducted in groups, normally with 6 to 8 individuals per class (**Evidence D**). **Note**: Refer to the following section of this synthesis for recommendations on patient selection.
SMOH (2006)	**Pulmonary Rehabilitation** Pulmonary rehabilitation is a structured multidisciplinary program of care for patients with chronic respiratory impairment that is individually tailored and designed to optimize physical and social performance and autonomy. Team members include respiratory physicians, family physicians, nurses, physiotherapists, occupational therapists, dieticians, and medical social workers. Pulmonary rehabilitation can be conducted as inpatient, outpatient or home programs. Consideration of cost, availability and accessibility will determine the patient's choice. Studies have shown that COPD patients undergoing pulmonary rehabilitation have experienced the following benefits: • Improvement in exercise capacity and functional walking distance • Relief of dyspnoea and fatigue as well as enhancement of mastery (sense of control over condition) • Improvement in health related quality of life • Reduction in the number of hospitalizations and days in hospital • Reduction in anxiety and depression
VA/DoD (2007)	**Pulmonary Rehabilitation** Despite optimal pharmacological management, patients with COPD frequently have persistent symptoms, reduced exercise tolerance, inability to perform their activities of daily living, and reductions in health and functional status.

	Pulmonary rehabilitation complements standard medical therapy and provides additional benefits in these areas. Pulmonary rehabilitation is a multidisciplinary program of care that comprises a variety of interventions grouped into categories: exercise training, education, and psychological and nutritional counseling. This therapy may result in significant clinical improvement in multiple outcome areas, including reduction in dyspnea as well as improvements in exercise endurance, muscle strength, health status, and healthcare utilization. While the individual components have benefits, the greatest efficacy is derived from a comprehensive, integrated program. Pulmonary rehabilitation should be one part of disease management of symptomatic patients with COPD. Clear goals should be developed for each patient and communicated to the healthcare team. Comprehensive programs are delivered by multidisciplinary teams of healthcare professionals. • The dyspnea and fatigue associated with physical activity leads patients with COPD to avoid such activities. As demanding physical activities are avoided, the cardiovascular system and peripheral muscles become deconditioned. These deconditioned muscles can be reconditioned with a structured exercise program. Such a structured exercise program can improve dyspnea, exercise endurance, maximal exercise, muscle strength, and QOL. • The goals of an exercise program are to improve daily function, exercise tolerance, and the dyspnea accompanying daily activities and exercise. • The effect of pulmonary rehabilitation on healthcare utilization is less clear; however, pulmonary rehabilitation that includes patient education may reduce inpatient length of stay. • The major components and benefits that may be obtained with pulmonary rehabilitation are summarized in Tables 8 and 9 of the original guideline document and are subsequently dealt with below.
PATIENT SELECTION **Abbreviations** **Back to TOC**	
ACCP/AACVPR (2007)	Pulmonary rehabilitation is appropriate for any stable patient with a chronic lung disease who is disabled by respiratory symptoms. Patients with advanced disease can benefit if they are selected appropriately and if realistic goals are set.

GOLD (2008)	**Patient Selection and Program Design** Although more information is needed on criteria for patient selection for pulmonary rehabilitation programs, COPD patients at all stages of disease appear to benefit from exercise training programs, improving with respect to both exercise tolerance and symptoms of dyspnea and fatigue (**Evidence A**). Data suggest that these benefits can be sustained even after a single pulmonary rehabilitation program. Benefit does wane after a rehabilitation program ends, but if exercise training is maintained at home, the patient's health status remains above pre-rehabilitation levels (**Evidence B**). To date there is no consensus on whether repeated rehabilitation courses enable patients to sustain the benefits gained through the initial course. The following points summarize current knowledge of considerations important in choosing patients: Functional status: Benefits have been seen in patients with a wide range of disability, although those who are chair-bound appear unlikely to respond even to home visiting programs (**Evidence A**). Severity of dyspnea: Stratification by breathlessness intensity using the MRC questionnaire (Figure 5.1-3 in the original guideline document) may be helpful in selecting patients most likely to benefit from rehabilitation. Those with MRC grade 5 dyspnea may not benefit (**Evidence B**). Motivation: Selecting highly motivated participants is especially important in the case of outpatient programs. Smoking status: There is no evidence that smokers will benefit less than nonsmokers, but many clinicians believe that inclusion of a smoker in a rehabilitation program should be conditional on their participation in a smoking cessation program. Some data indicate that continuing smokers are less likely to complete pulmonary rehabilitation programs than nonsmokers (**Evidence B**).
SMOH (2006)	**D** - Pulmonary rehabilitation may be considered for patients with the following ("Pulmonary Rehabilitation." 1999; Puhan et al., 2005; Salman et al., 2003): • Persistent symptoms especially dyspnoea • Reduced exercise tolerance or experience a restriction in activities

	• Recurrent admissions to hospitals over the last 6 months **(Grade D, Level 4)** The following conditions may adversely affect the outcome of pulmonary rehabilitation: 1. Conditions that may interfere with the patient undergoing the rehabilitation programme (e.g., advanced arthritis, inability to learn or disruptive behavior). 2. Conditions that may place the patient at undue risk during exercise training (e.g., severe pulmonary hypertension, unstable angina or recent myocardial infarction). 3. Poorly motivated patients who are unable to complete the entire rehabilitation programme.
VA/DoD (2007)	**Selection of Patients** • Pulmonary rehabilitation should be considered for patients with COPD who have dyspnea, reduced exercise tolerance, a restriction in activities, or impaired health status. **[A]** • Pulmonary rehabilitation should be offered to all patients who consider themselves disabled by COPD (Level 3 and above on the dyspnea scale). **[B]** • Pulmonary rehabilitation is recommended for patients with reduced exercise tolerance and restricted activities because of dyspnea. **[A]** **Education and Self-Management** • Patients with COPD with a prior hospitalization should be referred for pulmonary rehabilitation. **[A]**
EXERCISE TRAINING **Abbreviations** **Back to TOC**	
ACCP/AACVPR (2007)	Exercise training is one of the key components of pulmonary rehabilitation. The exercise prescription for the training program is guided by the following three parameters: intensity; frequency; and duration. The characteristics of exercise programs in pulmonary rehabilitation for patients

	with COPD have not been extensively investigated. • A program of exercise training of the muscles of ambulation is recommended as a mandatory component of pulmonary rehabilitation for patients with COPD. **Grade of Recommendation 1A** • Six to 12 weeks of pulmonary rehabilitation produces benefits in several outcomes that decline gradually over 12 to 18 months. **Grade of Recommendation 1A**. Some benefits, such as HRQOL, remain above control at 12 to 18 months. **Grade of Recommendation 1C** • Longer pulmonary rehabilitation programs (12 weeks) produce greater sustained benefits than shorter programs. **Grade of Recommendation 2C** • Lower-extremity exercise training at higher exercise intensity produces greater physiologic benefits than lower-intensity training in patients with COPD. **Grade of Recommendation 1B** • Both low- and high-intensity exercise training produce clinical benefits for patients with COPD. **Grade of Recommendation 1A** • Addition of a strength training component to a program of pulmonary rehabilitation increases muscle strength and muscle mass. **Strength of evidence 1A** • Unsupported endurance training of the upper extremities is beneficial in patients with COPD and should be included in pulmonary rehabilitation programs. **Grade of Recommendation 1A** • The scientific evidence does not support the routine use of inspiratory muscle training as an essential component of pulmonary rehabilitation. **Grade of Recommendation 1B** • Supplemental oxygen should be used during rehabilitative exercise training in patients with severe exercise-induced hypoxemia. **Grade of Recommendation 1C** • Administering supplemental oxygen during high-intensity exercise programs in patients without exercise-induced hypoxemia may improve gains in exercise endurance. **Grade of Recommendation 2C** • As an adjunct to exercise training in selected patients with severe COPD, noninvasive ventilation produces modest additional improvements in exercise performance. **Grade of Recommendation 2B**
GOLD (2008)	Exercise training. Exercise tolerance can be assessed by either bicycle ergometry or treadmill exercise with the measurement of a number of physiological variables, including maximum oxygen consumption, maximum heart rate, and maximum work performed. A less complex

approach is to use a self-paced, timed walking test (e.g., 6-minute walking distance). These tests require at least one practice session before data can be interpreted. Shuttle walking tests offer a compromise: they provide more complete information than an entirely self-paced test, but are simpler to perform than a treadmill test.

Exercise training ranges in frequency from daily to weekly, in duration from 10 minutes to 45 minutes per session, and in intensity from 50% peak oxygen consumption (VO_2 max) to maximum tolerated. The optimum length for an exercise program has not been investigated in randomized controlled trials but most studies involving fewer than 28 exercise sessions show inferior results compared to those with longer treatment periods. In practice, the length depends on the resources available and usually ranges from 4 to 10 weeks, with longer programs resulting in larger effects than shorter programs.

Participants are often encouraged to achieve a predetermined target heart rate, but this goal may have limitations in COPD. In many programs, especially those using simple corridor exercise training, the patient is encouraged to walk to a symptom-limited maximum, rest, and then continue walking until 20 minutes of exercise have been completed. Where possible, endurance exercise training to 60% to 80% of the symptom-limited maximum is preferred. Endurance training can be accomplished through continuous or interval exercise programs. The latter involve the patient doing the same total work but divided into briefer periods of high-intensity exercise, which is useful when performance is limited by other comorbidities. Use of a simple wheeled walking aid seems to improve walking distance and reduces breathlessness in severely disabled COPD patients (**Evidence C**). Other approaches to improving outcomes such as use of oxygen during exercise, exercising while breathing heliox gas mixtures, unloading the ventilator muscles while exercising, or use of pursed lip breathing remain experimental at present. Specific strength training is possible but its benefits remain uncertain, as do the effects of supplementation with anabolic steroids and the use of neuromuscular electrical stimulation.

The minimum length of an effective rehabilitation program is 6 weeks; the longer the program continues, the more effective the results (**Evidence B**). However, as yet, no effective program has been developed to maintain the effects over time. Many physicians advise patients unable to participate in a structured program to exercise on their own (e.g., walking 20 minutes daily). The benefits of this general advice have not been tested, but it is reasonable to offer

	such advice to patients if a formal program is not available. Some programs also include upper limb exercises, usually involving an upper limb ergometer or resistive training with weights. There are no randomized clinical trial data to support the routine inclusion of these exercises, but they may be helpful in patients with comorbidities that restrict other forms of exercise and those with evidence of respiratory muscle weakness. The addition of upper limb exercises or other strength training to aerobic training is effective in improving strength, but does not improve quality of life or exercise tolerance.
SMOH (2006)	**B** - The physical components of pulmonary rehabilitation should include both lower extremity training (e.g., bicycle, ergometry, treadmill) and upper extremity training (strength and endurance) ("Pulmonary rehabilitation: joint ACCP/AACVPR evidence-based Guidelines," 1997). (**Grade B, Level 2+**)
VA/DoD (2007)	**Exercise Training** • The exercise program should be supervised and should provide cardiovascular reconditioning with endurance and muscle strength training. **[A]** • The initial exercise program should be of sufficient length, duration, and frequency (see Appendix B: Structured Exercise Training Program in the original guideline document). **[B]** • Endurance training should be performed to improve physical endurance. **[A]** • Lower limb strength training should be performed to improve exercise tolerance (walking, cycling); upper extremity training improves arm strength. **[B]** • In order to maintain benefits, subsequent exercise training is needed. **[B]** • As studies show conflicting results, respiratory muscle training is not recommended to be part of a rehabilitation exercise program. **[B]**
NUTRITIONAL INTERVENTIONS/COUNSELING **Abbreviations** **Back to TOC**	
ACCP/AACVPR (2007)	There is insufficient evidence to support the routine use of nutritional supplementation in pulmonary rehabilitation of patients with COPD. **No recommendation is provided**.
GOLD	Nutrition counseling. Nutritional state is an important

(2008)	determinant of symptoms, disability, and prognosis in COPD; both overweight and underweight can be a problem. Specific nutritional recommendations for patients with COPD are based on expert opinion and some small randomized clinical trials. Approximately 25% of patients with *Stage II: Moderate COPD* to *Stage IV: Very Severe COPD* show a reduction in both their BMI and fat free mass. A reduction in BMI is an independent risk factor for mortality in COPD patients (**Evidence A**). Health care workers should identify and correct the reasons for reduced calorie intake in COPD patients. Patients who become breathless while eating should be advised to take small, frequent meals. Poor dentition should be corrected and comorbidities (pulmonary sepsis, lung tumors, etc.) should be managed appropriately. Improving the nutritional state of COPD patients who are losing weight can lead to improved respiratory muscle strength. However, controversy remains as to whether this additional effort is cost effective. Present evidence suggests that nutritional supplementation alone may not be a sufficient strategy. Increased calorie intake is best accompanied by exercise regimes that have a nonspecific anabolic action, and there is some evidence this also helps even in those patients without severe nutritional depletion. Specific nutritional supplements (e.g., creatine) may improve body composition, but further studies in large numbers of subjects are required before the routine use of these supplements can be recommended. Anabolic steroids in COPD patients with weight loss increase body weight and lean body mass but have little or no effect on exercise capacity.
SMOH (2006)	**Grade A** - Pulmonary rehabilitation programmes should include multicomponent, multidisciplinary interventions, which are tailored to the individual patient's needs. The rehabilitation process should incorporate a programme of physical training, disease education, and nutritional, psychological, and behavioural intervention.
VA/DoD (2007)	**Education and Self-Management** The benefit of education, psychosocial support, and nutritional therapy as a single intervention, without exercise, are less well-documented. **[I]**

EDUCATION
Abbreviations
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ACCP/AACVPR (2007)	Education should be an integral component of pulmonary rehabilitation. Education should include information on collaborative self-management and prevention and treatment of exacerbations. **Grade of Recommendation 1B**
GOLD (2008)	Education. Most pulmonary rehabilitation programs include an educational component, but the specific contributions of education to the improvements seen after pulmonary rehabilitation remain unclear.
SMOH (2006)	**D** - Psychosocial and behavioral interventions (health education, smoking cessation clinic, and support groups addressing psychosocial issues) as well as nutritional intervention should also be included as non-physical components of the comprehensive pulmonary rehabilitation programs ("Pulmonary Rehabilitation," 1999). (**Grade D, Level 4**)
VA/DoD (2007)	**Education and Self-Management** • Educational components and self-management programs should be included in rehabilitation programs, as it can reduce COPD exacerbations, hospital admission, and length of stay. **[B]** • Self-management programs should include the following **[B]**: a. Skills training to optimally control the disease b. Education about medications and devices and how to use them properly c. Instruction on how to deal with exacerbations d. Other aspects of coping with the disease • The benefit of education, psychosocial support, and nutritional therapy as a single intervention, without exercise, are less well-documented. **[I]**
PSYCHOSOCIAL/BEHAVIORAL INTERVENTIONS **Abbreviations** **Back to TOC**	
ACCP/AACVPR (2007)	The data suggest that depression and anxiety are more common among patients with COPD than in the public at large. Data indicate that psychosocial intervention may facilitate behavioral changes, such as smoking cessation, as well as the management of dyspnea. However, psychosocial interventions alone may not lead to reduced psychological distress. • There is minimal evidence to support the benefits of

	psychosocial interventions as a single therapeutic modality. **Grade of Recommendation 2C** • Although no recommendation is provided since scientific evidence is lacking, current practice and expert opinion support the inclusion of psychosocial interventions as a component of comprehensive pulmonary rehabilitation programs for patients with COPD.
GOLD (2008)	No specific recommendations offered.
SMOH (2006)	**D** - Psychosocial and behavioral interventions (health education, smoking cessation clinic, and support groups addressing psychosocial issues) as well as nutritional intervention should also be included as non-physical components of the comprehensive pulmonary rehabilitation programs ("Pulmonary Rehabilitation," 1999) (**Grade D, Level 4**)
VA/DoD (2007)	**Education and Self-Management** The benefit of education, psychosocial support, and nutritional therapy as a single intervention, without exercise, are less well-documented. **[I]**
FOLLOW-UP **Abbreviations** **Back to TOC**	
ACCP/AACVPR (2007)	Maintenance strategies following pulmonary rehabilitation have a modest effect on long-term outcomes. **Grade of Recommendation 2C**
GOLD (2008)	**Assessment and Follow-up** Baseline and outcome assessments of each participant in a pulmonary rehabilitation program should be made to quantify individual gains and target areas for improvement. Assessments should include: • Detailed history and physical examination • Measurement of spirometry before and after a bronchodilator drug • Assessment of exercise capacity • Measurement of health status and impact of breathlessness • Assessment of inspiratory and expiratory muscle strength and lower limb strength (e.g., quadriceps) in

	patients who suffer from muscle wasting The first two assessments are important for establishing entry suitability and baseline status but are not used in outcome assessment. The last three assessments are baseline and outcome measures. Several detailed questionnaires for assessing health status are available, including some that are specifically designed for patients with respiratory disease (e.g., Chronic Respiratory Disease Questionnaire, St. George Respiratory Questionnaire), and there is increasing evidence that these questionnaires may be useful in a clinical setting. Health status can also be assessed by generic questionnaires, such as the Medical Outcomes Study Short Form (SF36), to enable comparison of quality of life in different diseases. The Hospital Anxiety and Depression Scale (HADS) and the Primary Care Evaluation of Mental Disorders (PRIME-MD) have been used to improve identification and treatment of anxious and depressed patients.
SMOH (2006)	No recommendations offered.
VA/DoD (2007)	No recommendations offered.

STRENGTH OF EVIDENCE AND RECOMMENDATION GRADING SCHEMES **Abbreviations** **Back to TOC**	
ACCP/AACVPR (2007)	**High (A)** Evidence based on well designed randomized controlled trials (RCTs) yielding consistent and directly applicable results. In some circumstances, high-quality evidence can be the result of overwhelming evidence from observational studies. **Moderate (B)** Evidence based on RCTs with limitations that may include methodological flaws or inconsistent results. Studies other than RCTs that may yield strong results are also included in the moderate-quality category. **Low (C)** Evidence from other types of observational studies (the weakest type of evidence). **Strength of Recommendations** **1A** Strong recommendation

	1B Strong recommendation **1C** Strong recommendation **2A** Weak recommendation **2B** Weak recommendation **2C** Weak recommendation
GOLD (2008)	**Description of Levels of Evidence** A. *Sources of Evidence*: Randomized controlled trials (RCTs). Rich body of data. *Definition*: Evidence is from endpoints of well-designed RCTs that provide a consistent pattern of findings in the population for which the recommendation is made. Category A requires substantial numbers of studies involving substantial numbers of participants. B. *Sources of Evidence*: Randomized controlled trials. Limited body of data. *Definition*: Evidence is from endpoints of intervention studies that include only a limited number of patients, posthoc or subgroup analysis of RCTs, or meta-analysis of RCTs. In general, Category B pertains when few randomized trials exist, they are small in size, they were undertaken in a population that differs from the target population of the recommendation, or the results are somewhat inconsistent. C. *Sources of Evidence*: Nonrandomized trials. Observational studies. *Definition*: Evidence is from outcomes of uncontrolled or nonrandomized trials or from observational studies. D. *Sources of Evidence*: Panel consensus. Judgment. *Definition*: This category is used only in cases where the provision of some guidance was deemed valuable but the clinical literature addressing the subject was deemed insufficient to justify placement in one of the other categories. The Panel Consensus is based on clinical experience or knowledge that does not meet the above-listed criteria.
SMOH (2006)	**Levels of Evidence** **Level 1++**: High quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias. **Level 1+**: Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias. **Level 1-**: Meta-analyses, systematic reviews of RCTs, or RCTs

	with a high risk of bias **Level 2++**: High quality systematic reviews of case control or cohort studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal **Level 2+**: Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal **Level 2-**: Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal **Level 3**: Non-analytic studies (e.g. case reports, case series) **Level 4**: Expert opinion **Grades of Recommendation** **Grade A**: At least one meta-analysis, systematic review of randomized controlled trials (RCTs), or RCT rated as 1++ and directly applicable to the target population; or A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results **Grade B**: A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 1++ or 1+ **Grade C**: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or Extrapolated evidence from studies rated as 2++ **Grade D**: Evidence level 3 or 4; or Extrapolated evidence from studies rated as 2+ **GPP** (good practice points): Recommended best practice based on the clinical experience of the guideline development group.

VA/DoD (2007)

Quality of Evidence

I	At least one properly done randomized controlled trial (RCT)
II-1	Well designed controlled trial without randomization
II-2	Well designed cohort or case-control analytic study
II-3	Multiple time series, dramatic results of uncontrolled experiment
III	Opinion of respected authorities, case reports, and expert committees

Overall Quality

Good	High grade evidence (I or II-1) directly linked to health outcome
Fair	High grade evidence (I or II-1) linked to intermediate outcome; or grade evidence (II-2 or II-3) directly linked to health outcome
Poor	Level III evidence or no linkage of evidence to health outcome

Net Effect of the Intervention

Substantial	More than a small relative impact on a frequent condition with a substantial burden of suffering or A large impact on an infrequent condition with a significant impact on the individual patient level.
Moderate	A small relative impact on a frequent condition with a substantial burden of suffering or A moderate impact on an infrequent condition with a significant impact on the individual patient level.
Small	A negligible relative impact on a frequent condition with a substantial burden of suffering or A small impact on an infrequent condition with a significant impact on the individual patient level.
Zero or Negative	Negative impact on patients or

	No relative impact on either a frequent condition with a substantial burden of suffering; or an infrequent condition with a significant impact on the individual patient level.

Strength of Recommendation

	Net Benefit of the Intervention			
Quality of Evidence	**Substantial**	**Moderate**	**Small**	**Zero or Negative**
Good	A	B	C	D
Fair	B	B	C	D
Poor	I	I	I	I

Evidence Rating System

A	A strong recommendation that the clinicians provide the intervention to eligible patients. *Good evidence was found that the intervention improves important health outcomes and concludes that benefits substantially outweigh harm.*
B	A recommendation that clinicians provide (the service) to eligible patients. *At least fair evidence was found that the intervention improves health outcomes and concludes that benefits outweigh harm.*
C	No recommendation for or against the routine provision of the intervention is made. *At least fair evidence was found that the intervention can improve health outcomes, but concludes that the balance of benefits and harms is too close to justify a general recommendation.*
D	Recommendation is made against routinely providing the intervention to asymptomatic patients. *At least fair evidence was found that the intervention is ineffective or that harms outweigh benefits.*

	I — The conclusion is that the evidence is insufficient to recommend for or against routinely providing the intervention. *Evidence that the intervention is effective is lacking, or poor quality, or conflicting, and the balance of benefits and harms cannot be determined.* Where existing literature was ambiguous or conflicting, or where scientific data were lacking on an issue, recommendations were based on the clinical experience of the Working Group. These recommendations are indicated in the evidence tables as based on" Working Group Consensus" and given the grade **[I]**.

COMPARISON OF METHODOLOGY
Click on the links below for details of guideline development methodology

ACCP/AACVPR (2007)	GOLD (2008)	SMOH (2006)	VA/DoD (2007)

All of the groups performed searches of electronic databases to collect/select the evidence; ACCP/AACVPR and GOLD also performed hand-searches of published literature (primary and secondary sources). The three groups to describe this process, ACCP/AACVPR, GOLD and VA/DoD, provide relevant details including the names of databases searched, date ranges searched, and inclusion criteria applied. To assess the quality and strength of the evidence all four groups weighted it according to a rating scheme and provide the scheme. Methods used to analyze the evidence were similar as well, with all of the groups having performed a review of published meta-analyses as well as a systematic review. The ACCP/AACVPR, GOLD and VA/DoD systematic reviews incorporated evidence tables. ACCP/AACVPR and VA/DoD provide a description of the evidence analysis process; GOLD and SMOH do not.

Expert consensus was employed by all four groups to formulate the recommendations, and all of the groups, with the exception of GOLD, rated the strength of the recommendations according to a scheme. All of the groups except SMOH provide details regarding the recommendation formulation process. While none of the groups performed a cost analysis, ACCP/AACVPR, GOLD and SMOH reviewed published cost analyses and discuss the findings. With regard to methods used to validate the guideline, GOLD and VA/DoD sought both internal and external peer review and provide a description of the processes used. ACCP/AACVPR and SMOH do not provide information regarding any method(s) used to validate their guidelines.

SOURCE(S) OF FUNDING Abbreviations Back to TOC	
ACCP/AACVPR (2007)	Not stated
GOLD (2008)	Almirall, AstraZeneca, Boehringer Ingelheim, Chiesi, Dey, GlaxoSmithKline, Mitsubishi Tanabe Pharma, Novartis, Nycomed, Pfizer, Schering-Plough, Sepracor
SMOH (2006)	Singapore Ministry of Health
VA/DoD (2007)	United States Government

BENEFITS AND HARMS Abbreviations Back to TOC	
Benefits	
ACCP (2007)	Appropriate use of pulmonary rehabilitation
GOLD (2008)	Appropriate diagnosis, management, and prevention of COPD
SMOH (2006)	Appropriate diagnosis and management of patients with COPD
VA/DoD (2007)	Appropriate management of outpatient chronic obstructive pulmonary disease

CONTRAINDICATIONS Abbreviations Back to TOC	
ACCP/AACVPR (2007)	Severe osteoporosis is a contraindication to strength training.

GOLD (2008)	No contraindications related to pulmonary rehabilitation are provided.
SMOH (2006)	No contraindications related to pulmonary rehabilitation are provided.
VA/DoD (2007)	No contraindications related to pulmonary rehabilitation are provided.

Abbreviations
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ACCP/AACVPR, American College of Chest Physicians/American Association of Cardiovascular and Pulmonary Rehabilitation

BMI, body mass index

COPD, chronic obstructive pulmonary disease

GOLD, Global Initiative for Chronic Obstructive Lung Disease

HRQOL, health related quality of life

MRC, Medical Research Council

SMOH, Singapore Ministry of Health

VA/DoD, Department of Veterans Affairs, Department of Defense

VMT, ventilatory muscle training

This synthesis was prepared by ECRI Institute on October 30, 2007. It was reviewed by ACCP/AACVPR on November 23, 2007, by GOLD on December 19, 2007, and by SMOH on December 21, 2007. This synthesis was revised in June 2008 and June 2009 to update GOLD recommendations, and again in February 2010 to remove NCCCC/NICE recommendations and add VA/DoD recommendations. The information was verified by VA/DoD on March 12, 2010.

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